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ELECTRONICS AND ELECTRICAL ENGINEERING

No. 99



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USSR REPORT

ELECTRONICS AND ELECTRICAL ENGINEERING

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UDC 550.837:621.396.98

PRACTICAL APPLICATION OF SURFACE PROBING BY RADAR METHOD IN PRECISE PROSPECTING FOR PEAT DEPOSITS AND IN GEOLOGICAL WATER SURVEYS OVER TERRITORY OF LATVIAN SSR

Riga IZVESTIYA AKADEMII NAUK LATVIYSKOY SSR: SERIYA FIZICHESKIKH I TEKHNICHESKIKH NAUK in Russian No 5, Sep-Oct 82
(manuscript received 30 Mar 82) pp 83-87

FINKEL'SHTEYN, M. I., ZOLOTAREV, V. P., BIRGER, A. Ya. and BUSH, L. Ya.,
Riga Institute of Civil Aviation Engineers imeni Lenin Komsomol and
Geological Administration of LaSSR

[Abstract] In the radar method of probing the earth crust one uses meter-wavelength electromagnetic energy pulses generated by impact excitation of the transmitter antenna with voltage pulses of nanosecond duration, and one measures the thickness of a geological layer, i. e., the depth of its reflecting boundary on the basis of time intervals between arrivals of reflected signals at the receiver antenna. The feasibility of using this method for precise prospecting of peat deposits and underground water was demonstrated in the Latvian SSR in 1973 and in 1978, respectively. The original necessary equipment included, besides radar transmitter and receiver with antennas, as well as an oscillographic indicating instrument and a magnetophone. Additional equipment developed in 1980-82 includes an indicating instrument with brightness modulation and an objective lens for photographic recording on moving film. Both method and equipment were tested during winter and summer in "Laugas" and "Salas 1" fields. The probing signal of 70 MHz average frequency propagated through peat at an average velocity of 36 m/ μ s with a 2.7 dB/m attenuation and through sand at an average velocity of 156 m/ μ s with a 1.8 dB/m attenuation. The thickness of peat layers could be determined with an error not exceeding 5% down to a 6 m depth and water profiles could be determined with an error not exceeding 2.5% down to 7.5 m depth. Figures 5; references: 3 Russian. [95-2415]

UDC 621.317.76:621.397.13

TRANSIENT PROCESSES IN SWITCHING OUTPUT STAGES OF CONTROL-PULSE GENERATORS
FOR CHARGE-COUPLED DEVICES

Moscow TEKHNKA KINO I TELEVIDENIYA in Russian No 10, Oct 82 pp 50-53

MILENIN, N. K. and MILENINA, S. A., All-Union Scientific Research Institute
of Television and Radio Broadcasting

[Abstract] Two-level switching circuits with transistor-transistor logic and with push-pull two-transistor complementary output stages are often used for charge-coupled devices in time-base supply systems. In the present paper, the transient process during a switching cycle is analyzed on the basis of the equivalent circuit, first of a bidirectional switch and then of a unidirectional switch with nonlinearity introduced by the diodes. Anomalous voltage overshoots are estimated asymptotically in the case of unidirectional switches controlling the n channels of a three-phase charge-coupled device according to a specific program. The results reveal that voltage overshoots can be minimized by programming the operation of switches so that only one of them will be closed during any given interval of time, i.e., with overlap of pulse edges but no overlap of pulse tops between adjacent phases. It may also be expedient to shunt such switches with appropriately reverse-biased auxiliary diodes. Figures 3; references 5: 3 Russian, 2 Western.
[100-2415]

UDC 778.5:621.397.13

TELEVISION-CINEMATOGRAPHIC FACILITY 1KNK-M

Moscow TEKHNKA KINO I TELEVIDENIYA in Russian No 10, Oct 82, pp 27-34

POTASHNIKOV, A. I., All-Union Scientific Research Institute of Cinematography

[Abstract] The mobile television-cinematographic facility 1KNK-M has been developed. It is an improved version of the experimental 1KNK and the earlier "Izofron-II", for conventional and wide-screen on-the-spot filming

of sports and games. Enterprises of the Moscow "Ekran" Scientific-Industrial Association took part in the creation and introduction of the cinotelevision complexes: the Moscow Design Bureau for cinematographic Equipment, the "Moskinap" Plant, the Central Design Bureau for Motion Picture Equipment, the "Ukrkinotekhnika" Design Office of the All-Union Scientific-Research Institute of Cinematography, and the studios imeni A. P. Dovshenko and M. Gorkiy. The facility provides for single-camera or two-camera filming, synchronous sound tracking, control recording of image and sound, sound amplification, electronic duplication of video-phonograms, interservice communication and recording of coded service information, inspection for reruns, electric power supply by hookup to commercial a.c. network or from autonomous portable set of storage batteries, transportation and storage of operating equipment, and transportation of 7-member crew. The equipment includes VO-2860/4800 Sony "U-matic" videomagnetophone cassettes. Eventually these will be replaced by "Ritm 310/320" and "Rita-reporter" sets. Appurtenances include a producer's control desk. Figures 12: references: 3 Russian.
[100-2415]

UDC 621.396.6

ANALYSIS OF DYNAMIC PRECISION OF DIGITAL CIRCUITS

Moscow MIKROELEKTRONIKA in Russian Vol 11, No 3, May-Jun 82
(manuscript received 17 Dec 81) pp 244-253

ARUTYUNOV, P. A., Moscow Institute of Electrical Machine Construction

[Abstract] Theory of the dynamic precision of digital circuits is studied with the aid of terms and definitions of linear signal-flow graphs and equivalent matrix and topological presentations. By virtue of this, use of the conclusions of the principal relations for digital circuits is shown to be possible. The following items are considered: 1) General equation for error of digital circuit connected with limitation on length of registers; 2) Models of first order sensitivity and methods for further experimental and analytical determination; 3) Transfer functions of branches for quantization errors; 4) Algorithmic procedure for calculation of modal quantities; and 5) Organization of calculation of transfer functions in sensitivity models. It is recommended that this be done using a matrix form of presentation of a transfer equation for a reference and transposed circuits. Figures 2; references 8: 6 Russian, 2 Western in translation.
[23-6415]

UDC 621.396.6

NEW APPROACH TO SOLUTION OF CERTAIN PROBLEMS OF GRAPH THEORY DURING
MICROCIRCUIT PLANNING

Moscow MIKROELEKTRONIKA in Russian Vol 11, No 3, May-Jun 82
(manuscript received 15 May 81) pp 254-258

YEROKHIN, V. V., NOSKOV, Yu. M. and SYPCHUK, P. P., Moscow Institute of
Electrical Machinery Construction

[Abstract] In the case of a topological approach to planning of integrated circuits (IC), as a rule the mathematical model of a circuit is a graph.

With the use of such a model as a function of the distinctive features of the planned IC, it is necessary to solve four problems. The present work proposes a new approach to a solution of these problems, the mathematical positions lying at the basis of the proposed approach are demonstrated, and solution algorithms are considered. Terms and designations to be used are explained. Two statements are required to solve the four problems, one of which is known and the other is formulated and proved in the text. In addition, a deformation of certain transfers of a graph is used. Statements are solved which make it possible to formulate a number of problems of graph theory, among them problems connected with planning of IS in terms of integral linear programming (ILP). Some of the problems formulated are: 1) Determination of the number of crossings of graph $G(V,E)$; 2) Isolation of maximum planar subgraph of $G(V,E)$; and determination of thickness of graph t and partitioning of graph into t planar subgraphs. The formulation of the problems presented makes their solution possible by standard ILP algorithms. References 3: 2 Russian, 1 Western in translation. [23-6415]

UDC 621.396.6.001.2

MINIMIZATION OF NUMBER OF STATES OF TRANSITION GRAPH AND ITS EFFECT ON DIMENSIONS OF CONTROL AUTOMATONS BASED ON ULTRA LARGE INTEGRATED CIRCUITS OF PROGRAMMABLE LOGICAL MATRICES

Moscow MIKROELEKTRONIKA in Russian Vol 11, No 3, May-Jun 82
(manuscript received 17 Dec 81) pp 259-264

GALITSYN, A. A., Moscow Engineering Physical Institute

[Abstract] An analysis is made of the effect of the principal parameters of a transition graph on the structural topological characteristics of an automaton in the case of trivial realization on the basis of a programmable logical matrix (PLM). Algorithms for minimization of the number of states of a graph of transitions are presented, which assure a decrease of the cost of realization of automats based on PLM. The following items are studied: 1) Synthesis of synchronous automats; 2) Evaluation of the complexity of trivial realization of automaton; 3) Assembling of equivalent states; and 4) Assembling of compatible states. Figures 2; tables 5; references 8: 7 Russian, 1 Western. [23-6415]

COMPUTERS

CHARACTERISTIC OF STORAGE BASED ON CHARGE-COUPLED DEVICE WITH METAL-NITRIDE-OXIDE-SEMICONDUCTOR MEMORY ELEMENTS

Moscow MIKROELEKTRONIKA in Russian Vol 11, No 3, May-Jun 82
(manuscript received 15 Aug 80) pp 213-218

RAKITIN, V. V., SAFONOV, A. G. and TISHIN, Yu. I.

[Abstract] This paper describes the operating conditions and characteristics of a preprogrammed storage based on a charge coupled device (CCD), with metal-nitride-oxide semiconductor (MNOS) memory elements. These elements have a capacity of 256 bits. The following items are discussed: 1) Construction of memory element; 2) Information read out; 3) Information recording on MNOS CCD; and 4) Charge storage. The results of investigation of the characteristics of read out, erasure, recording and information storage in a storage based on CCD with MNOP-capacitors, located in a row with transfer electrodes, show that in a given memory there remains a high efficiency of charge transfer with respect to the CCD, there takes place a certain recording, read out and information storage. The spread of the read out characteristics from element to element is not more than ~20%. Figures 5; references 5: 3 Russian, 2 Western (1 in translation).
[23-6415]

UDC 621.382

SPECIAL FEATURES OF CURRENT TRANSFER AND EFFECT OF SWITCHING IN INDEPENDENT ELEMENTS OF SEMICONDUCTOR MEMORY BASED ON HETEROSTRUCTURE WITH TUNNEL THIN DIELECTRIC

Moscow MIKROELEKTRONIKA in Russian Vol 11, No 3, May-Jun 82
(manuscript received 17 Dec 81) pp 231-237

TERESHIN, S. A., MAD'YAROV, M. R., MALAKHOV, B. A., BARU, V. G.,
YELINSON, M. I. and POKALYAKIN, V. I., Institute of Radio Engineering and Electronics, USSR Academy of Sciences

[Abstract] The principal results are presented of investigations of current transfer and the effect of switching in heterostructures of silicon--tunnel

thin layer of silicon--silicon dioxide--stannic oxide--metal. A method is described for obtaining experimental specimens with a stabilization making it possible with statistical assurance to measure the characteristics of the heterostructure and to investigate the principal features of current transfer. The results of measurements are described. In a general form the volt-ampere characteristics of the heterostructures mentioned above are characterized by two stable states: high-resistance and low-resistance. The regularity of current-transfer in the two states is investigated. In addition, the behavior is studied of the activation energy of the steady through current at the temperature interval $\Delta T = 100^\circ \text{C}$ for various sections of the volt-ampere characteristics. A physical model is proposed which makes it possible qualitatively to describe from a single point of view the mechanism of switching on, memorization, and switching off of the low-resistance state of the structure in question. This mechanism has the special features of a strong mutual effect of the electron and ion currents under the conditions of a Joule heating-up in the switching channel. The authors thank A. M. Fadeyev for assistance in preparing specimens. Figures 4; references 4: 1 Russian, 3 Western. [23-6415]

UDC 621.382

INVESTIGATION OF ENERGY-INDEPENDENT MEMORY ELEMENTS BASED ON Si--SiO₂--SnO₂--METAL (MOOP-SYSTEM) HETEROJUNCTIONS

Moscow MIKROELEKTRONIKA in Russian Vol 11, No 3, May-Jun 82
(manuscript received 17 Dec 81) pp 238-243

NAD'YAROV, M. R., TERESHIN, S. A., YELINSON, M. I., MALAKHOV, B. A.,
POKALYAKIN, V. I., and SHEVCHENKO, O. F., Institute of Radio Engineering
and Electronics, USSR Academy of Sciences

[Abstract] Solution of the problem of developing energy-independent memory elements on the basis of heterojunctions is connected with the creation of stable reproducible technology as well as the choice of optimum construction and the properties of the components of the base element. In the present paper methods for creating Si-SiO₂-SnO₂-metal (MOOP structure) heterostructures, the properties of SnO₂ films, and the parameters of the memory elements are investigated. It is shown that when the selection of a regime for preparation, construction and properties of the Si-SiO₂-SnO₂-metal is optimum, the model element of the energy-independent semiconductor memory possesses completely satisfactory, controlled operational characteristics and reproducibility. In addition, the technology of obtaining the element is fully compatible with standard integrated technology. The authors thank A. S. Vedeneyev for conducting Hall measurements, as well as A. M. Fadeyev for assistance in production of the structure in question. Figures 7; references 8: 4 Russian, 4 Western. [23-6415]

USE OF CODES WITH BYTE STRUCTURE FOR CORRECTION OF STORAGE ERRORS

Moscow MIKROELEKTRONIKA in Russian Vol 11, No 3, May-Jun 82
(manuscript received 4 Feb 81) pp 277-279

PYATOSHIN, Yu. P. and TUZIKOV, V. A.

[Abstract] This brief communication is concerned with the problem of increasing the reliability of semiconductor storage devices which are constructed on the basis of integrated-circuit on-line storage (OZU) or permanent storage (PZU). Codes with a byte organization are used for correcting byte errors. A block diagram is shown on the principles of construction of an OZU and a PZU, each with correction of errors, and intended for storage of M k -digit binary words. A block diagram is presented which shows the practical use of a byte (6,4) code for correction of byte errors in a device for storage of 256 16-digit words, constructed on an integrated circuit PZU with a 256 x 4 byte organization. It is concluded that the method shown for correction of byte errors can be recommended during development of reliable storage devices constructed on the basis of integrated circuit OSU or PZU with byte organization. Figures 2; references 10: 9 Russian, 1 Western in translation. [23-6415]

POSSIBILITY OF CONTROL CAPACITY INCREASE OF CHARGE COUPLED DEVICE BASED ON NARROW-ZONE SEMICONDUCTOR

Moscow MIKROELEKTRONIKA in Russian Vol 11, No 3, May-Jun 82
(manuscript received 6 Apr 81) pp 282-284

DENISENKO, V. V. and SHAKHIDZHANOV, S. S.

[Abstract] In this brief communication the control capacities are calculated of a charge coupled device (CCD) based on a homogeneous semiconductor and a CCD with a variable zone regime. This is done in the case where the permissible magnitudes of timing voltages are limited by the appearance of an interzonal tuned breakdown. It is shown that by the introduction of a variable zone region in an infrared CCD it is possible considerably to increase its control capacity. This is done without change of the spectral range of photosensitivity. By virtue of a CCD with a variable zone region, automatic "antiblooming" also appears. This is caused by the fact that with an increasing cumulative charge above a definitive magnitude, a shift begins of the red boundary of photosensitivity. There is a smaller noise of surface generation as compared with a CCD based on a homogeneous semiconductor at the same spectral range. This is because at the boundary with the dielectric, the width of the forbidden band is larger than in the photosensitive region. Figures 2; references 5: 1 Russian, 4 Western. [23-6415]

UDC 539.293

DETERMINATION OF REGIME OF PREDIFFUSION DOPING OF SEMICONDUCTOR IN
APPROXIMATION OF LARGE ENERGIES

Moscow MIKROELEKTRONIKA in Russian Vol 11, No 3, May-Jun 82
(manuscript received 15 May 81) pp 279-282

DAVIDOVSKIY, V. M., SAMUSEVA, L. E., SUPRUN, A. D., FEDORCHENKO, A. M.

[Abstract] This brief communication discusses the possibility of an analytical solution of a problem dealing with determination of a regime of ion doping of a semiconductor. It is shown that an analytical solution of this problem has a number of advantages as compared with a numerical solution. This doping is in accordance with a specified prediffusion profile of the implantation of an impurity, or according to the profile of defects distribution produced during the implantation. A profile of the "step" type is considered in an approximation of large energies. In order to solve this problem an idealized problem is studied with a profile $n(x) = n_0$ with an indefinite maximum of energy (n = concentration of impurity at depth x). An expression is obtained for the energy density of a dose Q as a function of the energy of the doping ions E . The dependence of the concentration of an implanted impurity on the distance up to the surface of a semiconductor for various values of the maximum energy of the ions E_0 in a doping beam is presented in the form of graphs. Figures 1; references 6: 5 Russian, 1 Western.
[23-6415]

UDC [621.314.6:537.312.62].001.5

POWER PARAMETERS OF SUPERCONDUCTING FLUX PUMPS

Moscow ELEKTROTEKHNIKA in Russian No 11, Nov 82
(manuscript received 4 Jun 81) pp 29-32

ANTONOV, Yu. F., candidate of technical sciences and KAZOVSKIY, Ye. Ya., professor and doctor of technical sciences, All-Union Scientific Research Institute for Electrical Machines

[Abstract] This paper is a continuation of the authors' earlier paper: "Theory of Flux Pumps" [ELEKTROTEKHNIKA, No 9, 1982]. Analytical expressions

are derived for the power, losses and efficiency of a flux pump and then checked against the experimental data for three different pumps described in American literature. The operating frequency of the three variants ranged from 20 to 0.2 Hz, the load inductance from 9 to 0.18 mH, the normal state electrical resistance of the switch from 0.55 to 0.01 mΩ and the main flux linkage from 2.5 to 0.288 mWb. The comparison between the experimental and theoretical data is illustrated graphically; the maximum power of a thermally switched flux pump is achieved with a load current 50% of the ultimate (not taking into account open switch losses) and an efficiency of 50%. There are two major types of losses in such superconducting converters: losses occurring during the process of opening the switch and losses in the closed state when the current in the transformer primary changes. To boost the efficiency, the secondary must be made with as small an inductance as possible and as high an ohmic resistance of the switches in the normal state as possible. Figures 3; tables 1; references 7: 1 Russian, 6 Western.
[94-8225]

UDC 621.382

STATIC CHARACTERISTICS OF FIELD-EFFECT TRANSISTOR WITH SCHOTTKY BARRIER BASED ON GALLIUM ARSENIDE

Moscow MIKROELEKTRONIKA in Russian Vol 11, No 3, May-Jun 82
(manuscript received 6 Apr 81) pp 208-212

STAROSEL'SKIY, V. I., Moscow Institute of Electronic Technology

[Abstract] A simple method is proposed for calculation of the volt-ampere characteristic (VAC) of a gallium-arsenide field-effect transistor (FET), taking into account the ohmic resistance of the passive regions of the channel and the contact resistances of the drain and the source. The parameters of the model are expressed directly through the electrophysical and topological parameters of the structure. The structure is shown of a FET with a Schottky barrier and semiinsulating GaAs ($P \approx 10^8$ ohm-cm). In the majority of cases, a piecewise linear approximation of the VAC can be used for analysis of pulse circuits. Good agreement of calculated and experimental results in a wide range of currents make it possible to recommend the proposed method for calculation, design and optimization of the static characteristics of nonlinear integral circuits based on gallium arsenide. In view of its simplicity, the model is suitable for operational engineering calculations not requiring use of a computer. Direct connection of the parameters of the model with the electrophysical parameters of the structure makes it possible to take the effect of temperature into account. Figures: 6 Western, 1 in translation.
[23-6415]

CONTROLLER BASED ON MOS-STRUCTURE WITH RESISTIVE ELECTRODE

Moscow MIKROELEKTRONIKA in Russian Vol 11, No 3, May-Jun 82
(manuscript received 5 May 81) pp 229-230

NEGODENKO, O. N., MIROSHNICHENKO, S. P. and SUKHINOV, A. I., Taganrog Radio Engineering Institute

[Abstract] A MOS-structure is considered which differs from the conventional by the fact that in it the depletion channel is formed only under a thin oxide of constant width, and the resistive electrode is fulfilled with a width which changes according to a selected law, during which one part of the resistive electrode is located on a thin oxide and the other on a thick, under which the depletion channel is not formed. The longitudinal field intensity in the depletion channel caused by the action of voltages V_1 and V_2 ($V_2 > V_1$) can change according to a specified law. A machine program composed in PL/I language was realized on a YeS-1020 computer. The numerical solution of the continuity equations for a constant and decreasing field intensity along the channel shows that in the latter case a smaller change is observed of the form of the signal under the influence of diffusion and the induced field. Figures 2; references 4: 2 Russian, 2 Western. [23-6415]

INSTRUMENTS & MEASUREMENTS

NEW MEASUREMENT INSTRUMENTS

Moscow IZMERITEL'NAYA TEKHNIKA in Russian No 10, Oct 82 pp 77-78

[Abstract] Specifications and descriptions are given for the following new measurement instruments: 1) The BV-5085 gear tooth measuring instrument is designed to determine the deviation of tooth thickness along a chord, positioned a specified distance from the periphery of the projections of cylindrical, externally engaging gear wheels, as well as conical gear wheels in the end cross-section and worm screws and worm gear wheels. The gear wheel sizes which can be measured range from 1 to 16 mm and 16 to 32 mm. The scale division of the micrometer heads is 0.01 mm and the measurement test force is 300 cN. The best error is ± 10 micrometers for a normalized measurement section of up to 100 micrometers and ± 30 micrometers above 150 micrometers. The MTBF is no less than 25,000 measurements with a probability of 0.8. It is manufactured by the Ministry of the Machine Tool and Tool Building Industry; 2) The RTs-600Ts24B platform scales are designed for the static weighing and documentation of various loads up to 600 kg. The scale division on the recording document is 0.2 kg. Minimum weighable amount is 10 kg and the maximum is 600 kg. Minimum error is ± 0.1 kg in the 10 to 100 kg range and ± 0.4 kg in the worst case. It is manufactured by the Ministry of Instrument Making, Automation Equipment and Control Systems; 3) The VMD-12 magnetic, interlocking vacuum gauge is designed to meter pressure in a range of from $1 \cdot 10^{-4}$ to 1 Pa, as a transducer in automated vacuum systems. The vacuum gauge provides for signaling at any specified pressure level in the above range; the relative error in the actuation and release of the associated interlock where the dry air or nitrogen pressure is $1 \cdot 10^{-3}$ to $1 \cdot 10^{-1}$ Pa ranges from -60 to +100% and no error standard is set for the other ranges. The metering unit of the vacuum gauge feeds out a voltage of $+2,500 \pm 50$ volts with a supply voltage from the mains of 220 V. The relative current measurement error of the transducer of the metering unit (into a load of no less than 2 Kohm) is no more than -15 to +20% in a range of $9 \cdot 10^{-7}$ to $1.8 \cdot 10^{-3}$ A. The overall dimensions are 340 x 80 x 158 mm and the weight is 3.5 kg; and 4) the PMM-44 and PMM-44F manometric transducers are designed to convert a pressure to a current in a range of $1 \cdot 10^{-4}$ to 1 Pa. The magnetic induction in the center of the magnet is no less than 90 ± 4 MHy. The transducer is vacuum tight and the overall leakage does not exceed $5 \cdot 10^{-10}$ 1-mm Hg/sec. The MTBF is no less than 10,000 hours; the transducer weighs 0.09 kg and has dimensions of 83 x 24 x 24 mm.

The manufacturer of the transducers is the Ministry of Instrument Building, Automation Equipment and Control Systems.
[92-8225]

UDC 006.65:389.14:531.781.2.08.92

OPTIMIZATION OF INDUSTRY-WIDE TENSORESISTOR PRODUCT LIST

Moscow IZMERITEL'NAYA TEKHNIKA in Russian No 9, Sep 82 pp 25-26

BAZZHIN, Yu. M., KLOKOVA, N. P. and KHRAKOVSKIY, A. I.

[Abstract] At the present time enterprises of the USSR Ministry of Instrument Making, Automation Equipment, and Control Systems (Minpribor) alone produce 9 types of tensoresistors with 220 different ratings, more than half of them already almost obsolete on paper substrate with a 5 mm or larger base for operation within the $+50^{\circ}\text{C}$ temperature range. The undesirability of such a product diversification with inevitable overlap is illustrated by production at the VEDA Industrial Association plants. The product list here could be optimized by development of fewer tensoresistors with broader functional capabilities, as is being done by the HBM GmbH (FRG) in the case of foil tensoresistors designed for operation at $70-200^{\circ}\text{C}$ statically and within the $+200^{\circ}\text{C}$ range dynamically. Successful efforts have already been made by the VEDA Industrial Association, in cooperation with NIKIMP (Scientific Research and Engineering Institute of Testing Machines, Instruments and Mass Measuring Devices). The model KF5 has the same service characteristics but better metrological characteristics than the old KF4 model, with "phenilon" high-temperature paper substrate impregnated with phenolic adhesive and coated with protective polyamide film. It can replace not only the KF4 but also the most obsolete PKB model. Together with models PKP and NMT-450, model KF5 can cover the high-temperature tensoresistor product list. No attempts have been made so far to streamline the low-temperature and large-strain tensoresistor product list.
[98-2415]

UDC 389.14:551.508.1

STATE OF ART AND PROSPECTS FOR DEVELOPMENT AND PRODUCTION OF HYGROMETERS AND MEANS OF THEIR METROLOGICAL QUALITY CONTROL

Moscow IZMERITEL'NAYA TEKHNIKA in Russian No 9, Sep 82 pp 46-50

MANDROKHLEBOV, V. F. and ARUTYUNOV, Yu. V.

[Abstract] Hygrometers are being developed by at present by six organizations, of which the principal ones are the Tbilisi "Analitpribor" Scientific-Industrial

Association and the Angarsk Experimental-Engineering Office for Automation (OKBA). Since 1978 they have been produced at the Gorkiy Experimental Manufacturing Plant for Analytical Instruments (GOZAP) which specializes in the production of hygrometers. In the field of hygrometry the Institute of State Standards became the Siberian Affiliate of the All-Union Scientific Research Institute of PhysicoTechnical and RadioTechnical Measurements (VNIIFTRI) at Irkutsk. The devices now produced include psychrometric, condensation-type, and sorption-type electrolytic hygrometers, also heatable LiCl hygrometers and hygrometers of the sorption-frequency type with "piezoquartz weighing." Their applications range from measurement of the dew point to air conditioning, in metallurgy as well as in the food industry or in the laboratory, in addition to general-purpose applications. There are four methods with appropriate primary reference standards available for their metrological quality control, none of them adequate alone under all conditions but all together covering the entire humidity and temperature range most effectively. They are the salt method, the two-temperature method, the two-pressure method, and the phase-equilibrium method. Further development and improvement of quality control methods and reference standards are needed in anticipation of a 46 million rubles worth of hygrometer production during the Eleventh Five-Year Plan period. Tables 2.
[98-2415]

UDC 578:621:317.7:62-501

AUTOMATED EQUIPMENT FOR MEASURING IONIC COMPOSITION OF BIOLOGICAL SAMPLES

Moscow IZMERITEL'NAYA TEKHNIKA in Russian No 10, Oct 82 pp 38-40

AL'TMAN, A. Sh., KABANOVA, M. A., KREST'YANKIN, B. S., MATROSOV, V. A., POKROVSKAYA, A. V. and SHMIDT, A. M.

[Abstract] The AIK-1 automated metering unit, designed to measure and record the activity and concentration of ions at the cellular level by means of liquid, ion-selective micro-electrodes, as well as to determine the ion composition of biological fluids in a sample volume of 100 to 150 microliters, was developed in the VNIINauchpribor (All-Union Scientific Research Institute for Scientific Instruments) of the Leningrad "Burevestnik" Scientific Production Association in conjunction with the Institute of Evolutionary Physiology and Biochemistry imeni I. M. Sechenov of the USSR Academy of Sciences and Leningrad State University imeni A. A. Zhdanov. The equipment complex employs a potentiometric circuit to measure the e.m.f. of a galvanic element consisting of the ion-selective electrode and a comparison electrode. System operation is described in light of two block diagrams: one of the overall system and one showing the electrometer, including the DC amplifier, A/D converter, output amplifier and measurement range switching circuitry. The liquid ion-selective electrode is a glass micropipette filled with an ion exchange liquid and having a tip diameter of 0.5 to 1 micrometer. The miniature ion-selective electrodes have an ion exchange membrane selective to calcium, potassium and nitrate ions, where the tip diameter is 5 mm.

The electrometer has a voltage measurement range (either polarity) of $5 \cdot 10^{-6}$ to 10 volts with an error of 2 to 0.5%; a current range (either polarity) of from $5 \cdot 10^{-17}$ to 10^{-6} A with an error of 10 to 2%; the mean square noise level at the analog output, referenced to the input, is $1 \cdot 10^{-6}$ volts for voltage measurements and $1 \cdot 10^{-17}$ A for current measurements (the readout settling time is 30 seconds). The voltage measurement input impedance is 10^{16} ohms; the zero level instability of the electrometer during voltage measurements after 24 hours of continuous duty is no more than 100 microvolts; the power consumption is no more than 60 VA and the weight does not exceed 16 kg. Figures 2.
[92-8225]

UDC 621.039.5:621.3

ELECTROMETER INSTRUMENTATION IN NUCLEAR REACTOR MONITOR AND PROTECTION SYSTEMS

Moscow IZMERITEL'NAYA TEKHNIKA in Russian No 10, Oct 82 pp 40-42

GRAFOV, V. S., ZHIL'TSOV, Yu. N., KOLESNIKOV, V. V., KREST'YANKIN, B. S., MATROSOV, V. A. and TIMOSHCHUK, Ye. I.

[Abstract] A special purpose electrometer, the ITLO2 linear current meter, designed for use in nuclear reactor control and monitor systems as well as low current measurements in physical experiments, was developed and placed in series production by VNIINauchpribor (All-Union Scientific Research Institute for Scientific Instruments) of the Leningrad "Burevestnik" Scientific Production Association. The ITL-02 contains an electrometer amplifier, automatic range switcher, emergency protection and alarm signaling unit, a device for monitoring the continuity of the connecting line and the meter itself, as well as a power supply. The operation of the ITLO2 is described by means of a block diagram. Prototypes of the instrument have successfully undergone operational testing. The measurement current range is broken down into 8 subranges from 10^{-11} to 10^{-4} amps; the subranges can be switched either manually or automatically. The overall error for the 10^{-11} A subrange is 10 %, it is 6 % for the 10^{-10} to 10^{-8} A range and 2.5 % for the 10^{-7} to 10^{-4} A ranges. The zero level instability after 8 hours of continuous operation does not exceed 10^{-12} A. The maximum output voltage for all subranges is 10 and 100 mV at the terminals for the autorecorder connection and 10 V at the computer plug. The instrument is powered from the 220 VAC mains with a power consumption of 85 VA; the dimensions are 480 x 160 x 320 mm and the weight is 20 kg. Figures 1.
[92-8225]

COMPARISON OF POWER METERS FOR MEDIUM POWER PULSED LASERS

Moscow IZMERITEL'NAYA TEKHNIKA in Russian No 10, Oct 82 pp 24-25

ZAKURENKO, O. Ye., ZINCHENKO, N. I. and KUZ'MICHEV, V. M.

[Abstract] A conical thermocouple calorimeter, laser ice calorimeter and ponderomotive meter with energy measurement ranges of 3 - 3,000 J, 300 - 3,000 J and 10 - 10,000 J, respectively, were compared to ascertain any systematic errors which were not reflected in the specifications. A GOS-1001 pulsed laser working at 1.06 micrometers was the radiation source while a thermocouple calorimeter served as the reference standard. The test configuration is described and the results of two series of measurements are summarized in tabular form. The energy levels ranged from 300 to 700 J and the reproducibility of the reference standard readings was no less than $\pm 0.2\%$. The meters exhibited no systematic errors which fell outside the claimed specification limits. A lack of conformity of the values from the thermocouple calorimeter and ponderomotive meter errors to the figures given for the reproducibility of their readings indicates that their precision can be improved in some cases by eliminating calibration. The overall measurement error for the three meters above was $\pm 5.2\%$, $\pm 0.6\%$ and $\pm 5.0\%$, respectively. Tables 2; references: 4 Russian. [92-8225]

DIGITAL INDUCTIVE METER FOR MEASUREMENT OF SMALL DIMENSIONS AND MOTIONS

Moscow IZMERITEL'NAYA TEKHNIKA in Russian No 10, Oct 82 pp 19-21

GALKIN, V. S. and FEDOTOV, A. V.

[Abstract] An analytical expression is adduced and used to develop recommendations for improving the precision of direct reading induction type meters for measuring small dimensions and amounts of movement. The circuit consists of an oscillator driving a balanced induction coil transducer which has an impedance proportional to the quantity being measured, which in turn drives the output display through a matching amplifier and synchronous detector. The recommendations involve primarily techniques for more precise balancing of coil resistance and the use of high precision electronic components. The minimum overall theoretical relative measurement error is estimated to fall in a range of $(0.1 - 0.3) \cdot 10^{-2}$. A specific design example for a direct conversion meter is described which uses 5 IC's and 4 discrete bipolar transistors; employing a standard F30 digital voltammeter with a measurement error of 0.05%. An overall relative measurement error of 0.1 to 0.2% is obtained in a measurement range of 1,400 micrometers. Figures 2; references: 7 Russian. [92-8225]

ON CALIBRATION OF DIODE LASER SPECTROMETERS

Moscow IZMERITEL'NAYA TEKHNIKA in Russian No 10, Oct 82 pp 25-26

ZASAVITSKIY, I. I., KOSICHKIN, Yu. V., KRYUKOV, P. V.,
NADEZHDINSKIY, A. I. and SHOTOV, A. P.

[Abstract] The 10^00-00^01 lasing band for CO_2 is measured in order to show that moderate heating of the gas leads to a significant increase in the absorption line intensity. These lines can thus be used as the reference datum for the calibration of semiconductor diode laser spectrometers. A test configuration is briefly described which employs a source laser in a cryostat, focusing lenses, cells containing the gas being studied and the CO_2 , and Fabry-Perot reference standard. The absorption line corresponding to the P(22) lasing transition is plotted for three gas temperatures. At room temperature, the absorption is quite low (gas pressure of 2,666.4 Pa). At 209°C the absorption rises to a level such that the lines are suitable for absolute calibration. A approximation is given which describes the precision of the determination of the position of the lines of the gas under study as a function of their distance from the reference datum. The error in the determination of the position of the line center does not exceed 0.0025 cm^{-1} , thus falling at the resolution level needed in doppler spectroscopy. Figures 2; references: 4 Western.
[92-8225]

UDC 621.317.799:621.382

LOCALLY ILLUMINATED SEMICONDUCTOR IN MICROWAVE FIELD

Riga IZVESTIYA AKADEMII NAUK LATVIYSKOY SSR: SERIYA FIZICHESKIKH I
TEKHNICHESKIKH NAUK in Russian No 5, Sep-Oct 82 (manuscript received 10 Mar 82)
pp 58-60

ABOLTIN'SH, E. E., Red Banner Riga Institute of Civil Aviation Engineers
imeni Lenin Komsomol

[Abstract] An experimental study was made of the diffusion of excess charge carriers in semiconductors placed in a microwave field and locally illuminated. A silicon wafer with an electrical resistivity of 0.3 ohm.cm was placed in the field of a slit source and a light spot was moved along its surface away from the source. The wafer was either grounded or insulated from ground. The distribution of excess charge carriers was found to indicate a wave process at the semiconductor surface, with sharp concentration peaks appearing under the light spot at definite distances from the microwave source. Further measurements on other silicon and germanium wafers of various configurations and with the electrical resistivity ranging from 0.2 to 0.57 ohm.cm (silicon) and 80 ohm.cm (germanium) have revealed that the pattern of this anomalous wave process does not depend on the geometry of a specimen but does depend on the electrophysical properties of its material. Figures 3; references: 3 Russian.
[95-2415]

UDC [621.314.21+621.384.634.3].042:536.5.001.24

CALCULATING MAXIMUM TEMPERATURE OF MAGNETIC CONDUCTORS IN TRANSFORMERS AND BETATRONS

Moscow ELEKTROTEKHNIKA in Russian No 11, Nov 82
(manuscript received 5 Nov 81) pp 19-20

KONOVALOVA, L. S., LOGINOV, V. S., candidates of technical sciences,
Tomsk Polytechnical Institute

[Abstract] Assuming a rectangular magnetic conductor, a system of equations in cartesian coordinates is solved in order to find the temperature field in the conductor along the X and Y axes for various thermal conductivity coefficients and with asymmetrical cooling. A BESM-4 computer was used to calculate this temperature field for a magnetic conductor with dimensions of $2R_x 2R_y = 0.16 \times 0.48 \text{ m}^2$, where the heat dissipation coefficients at the surfaces were all $62.64 \text{ W/m}^2 \cdot ^\circ\text{K}$, the thermal conductivity coefficients were $1.163 \text{ W/m} \cdot ^\circ\text{K}$ along the X axis and $45.375 \text{ W/m} \cdot ^\circ\text{K}$ along the Y axis; the liberated internal heat was $30,238 \text{ W/m}^3$ and the air temperature was 35°C . The program also specified the Pomerantsev and Biot numbers as well as the dimensionless X and Y coordinates and a dimensionless R parameter along the Y axis. Some 108 variants for the calculation of the temperature field with symmetrical and asymmetrical cooling conditions were run to ascertain the impact of the geometric dimensions, cooling conditions, internal heat liberation and thermal conductivity on the maximum temperature defined according to an analytical expression adduced in the paper. The maximum temperature can be satisfactorily calculated in terms of the maximum temperatures of the most heated surfaces, yielding errors ranging from 0.806% to 2.5% depending which of 5 variants summarized in tabular form here are used. The maximum temperature can be computed for asymmetrical cooling conditions by first measuring the temperature at four points. Figures 1; tables 1; references: 2 Russian.
[94-8225]

LOSS CAUSED BY IMPAIRMENT OF ELECTRIC POWER SUPPLY IN PLASTICS PROCESSING PLANT

Novocherkassk IZVESTIYA VYSSHIKH UCHEBNYKH ZAVEDENIY: ELEKTROMEKHANIKA
in Russian No 9, Sep 82 (manuscript received 16 Feb 82) pp 1054-1057

KOVANOVA, INNA VIKTOROVNA, candidate of technical sciences, docent, and
PAPKOV, BORIS VASIL'YEVICH, candidate of technical sciences, docent,
Gorkiy Polytechnic Institute

[Abstract] Losses caused by impairment of electric power supply in plastics processing plants were measured and analyzed, for the first time industry-wide, at a plant consisting of two production lines: one making phthalic anhydride and one for making diethyl hexanol. The equipment, common for both product lines, includes a reversible water supply system, a water treatment plant, a compressor set, a nitrogen and oxygen supply system, and a refrigeration plant - all energized by electric power, as well as a separate steam supply and fuel supply. On the basis of available data, losses caused by impairment of electric power supply have been evaluated as a function of the shutdown time inasmuch as the latter affects each component of the operating equipment. The losses have also been broken down into the loss in nonproductive use of energy sources (steam, fuel) and the loss in nondelivery of products. Figures 1; tables 1; references: 2 Russian.
[69-2415]

REGRESSION ANALYSIS OF LOSSES CAUSED BY IMPAIRMENT OF ELECTRIC POWER SUPPLY IN PETROLEUM PROCESSING PLANTS

Novocherkassk IZVESTIYA VYSSHIKH UCHEBNYKH ZAVEDENIY: ELEKTROMEKHANIKA
in Russian No 9, Sep 82 (manuscript received 16 Feb 82) pp 1049-1053

CHERVONNYY, YEVGENIY MAKSIMOVICH, candidate of technical sciences, docent, and
SHCHEGOL'KOVA, TAT'YANA MIKHAYLOVA, senior engineer, Gorkiy Polytechnic Institute

[Abstract] An analytical mathematical method is shown for predicting losses which an industrial enterprise will suffer as a result of impairment of its electric power supply. The loss function is defined and evaluated by the system approach, which involves subdividing the production process into its elementary components and constructing econometric models of losses in each, then simulating the effects of impairment numerically on a digital computer and constructing multifactorial models for calculation of the losses by regression analysis of the simulation output data. The procedure has been

programmed specifically for petroleum processing plants. Regression analysis yields the loss as a linear function of shutdown time $L = b_0 + bt_{sh}$, where the correction factor b accounts not only for production volume, production cost, power requirement, etc., but also for their independence and high degree of correlation. The accuracy of econometric models has been evaluated in terms of the variance coefficient: ratio of standard deviation to average loss based on n observation samples. A statistical analysis of the results of such a simulation with use of analytical equations confirms the basic correctness of this method, if observation samples are adjusted to exclude anomalous input data and if losses in plants to be taken out of operation are treated separately. Figures 3; references 5: 4 Russian, 1 Western (in translation).
[99-2415]

UDC 621.391.63"313"(479.25)

PROSPECTS FOR DEVELOPMENT OF ATMOSPHERIC OPTICAL DATA TRANSMISSION SYSTEMS

Yerevan PROMYSHLENNOST' ARMENII in Russian No 8, Aug 82 pp 29-31

KAZARYAN, R. A., doctor of technical sciences, professor, director of Department of Quantum Electronics, Institute of Physical Research, ArSSR Academy of Sciences

[Abstract] Development of atmospheric optical data transmission systems began in 1960, immediately after the first continuous-wave laser had been produced. The main obstacles to reliable optical data transmission through the atmosphere are turbulence in pure air, caused by wind and temperature gradients and resulting in fluctuations of density and the refractive index, as well as presence of aerosol in the form of mist, clouds, or precipitation in air with water content. More research has been done so far on pure air as a transmission channel, mainly because here a laser beam only changes direction without being appreciably attenuated and widened, also because the presence of aerosol cannot be prevented and the only way to improve the transmission over such a channel seems to be increasing the laser power. Nevertheless other methods of improving optical data transmission over an atmospheric channel with aerosol should be possible, on the basis of theoretical and experimental studies of aerosol as a discrete scattering medium. In the meantime, optical data transmission over an atmospheric channel with pure but turbulent air can be advanced by further studies using optical filters and optoelectronic devices as well as adaptation and mathematical simulation methods. In the Armenian SSR research on optical data transmission over both kinds of atmospheric channel and on continuous-wave lasers for this application has been conducted since 1963 at the Yerevan State University and at the Institute of Physical Research especially established within the ArSSR Academy of Sciences. An experimental multichannel telephone laser communication line between Yerevan and Byurakan astrophysical observatories was installed in 1973, one of the first such lines in the world. Achievements have also been made in optimal and adaptive multichannel heterodyne reception of visible and infrared signals. Research is now underway on technology and application of optical fibers for special purposes such as intercomputer communication and message switching. References 4: 3 Russian, 1 Western. [96-2415]

ANTICIPATORY CONTROL OF LINEAR STATIONARY OBJECTS WITH DELAYS

Moscow AVTOMATIKA I TELEMEXHANIKA in Russian No 11, Nov 82
(manuscript received 28 May 81) pp 57-60

SOLODOVNIKOV, V. V. and FILIMONOV, A. B., Moscow

[Abstract] A continuous-duty linear anticipator is proposed for anticipating the motion of a linear stationary object within the time of signal delay in the control channels. Its operation involves integrating differential equations with delaying argument partly by the method of steps. The control problem is formulated for the class of linear stationary objects with delays in the internal communication channels as well as in the control channels, their motion in the absence of external interference being described by the differential-difference equation

$$S: \frac{d}{dt} x(t) = \sum_{k=0}^K A_k x(t - T_k) + Bu(t - h)$$

(x = phase vector of object, u = control vector, t = time, T_k = delay in internal communication channels, h = delay in control channels, A_k, B = constant real $n \times n$ matrix and $n \times r$ matrix, $k = 0, 1, \dots, K, K - 0$). The anticipator is synthesized on the basis of a theorem pertaining to n -th order stationary dynamic vector systems receiving an $x(t)$ signal at the input and forming an $\hat{x}(t + \Delta/t)$ signal at the output, the latter being the anticipatory estimate of the former: $\Delta \leq \min(T_1, h) > 0$ and $\epsilon \ll \delta = \max(T, h)$ - time lag. The method is illustrated on a typical example. In the special case of no delays in the internal communication channels $\Delta = h$. Figures 2; references 7: 5 Russian, 2 Western (1 in translation). [97-2415]

METHOD OF ANALYZING NONLINEAR MAPPING FOR UNIVALENCE AND ITS APPLICATION TO OBSERVABILITY PROBLEMS

Moscow AVTOMATIKA I TELEMEXHANIKA in Russian No 11, Nov 82
(manuscript received 1 Apr 81) pp 25-32

BEZZUBOV, Yu. V., Moscow

[Abstract] A method of analyzing a nonlinear mapping for univalence is proposed which differs from the Gale-Nikaido method in that the sufficient or necessary and sufficient conditions for mutual univalence can be found from the solution, respectively, to one or several equations of equalities in $2n$ variables and imposes no constraints on the form of the phase region. A scalar function $\varphi(u)$ of a scalar argument $u \in \{u\}$ and a scalar function $\varphi(u_2, u_1)$ of a vector argument (u_2, u_1) defined in the region $\{u\} \times \{u\}$ are considered and the properties of their slopes are examined in terms of derivatives. The criterion of one-to-one correspondence is then established in terms of the matrix of partial slopes, with the aid of two simple lemmas and an intricate third one, whereupon the criterion of global observability is established and illustrated on four specific examples. References 5: 3 Russian, 2 Western (1 in translation). [97-2415]

UDC 62-501.72:62-505

OPTIMUM QUALITY CRITERIA IN IDENTIFICATION PROBLEMS

Moscow AVTOMATIKA I TELEMEXHANIKA in Russian No 11, Nov 82
(manuscript received 6 Oct 81) pp 5-24

TSYPKIN, Ya. Z., Moscow

[Abstract] Formulation and subsequent solution of identification problems reduces to construction of an adjustable model of the object and, after selection of the quality criterion, constructing an algorithm for estimation of the object's parameters. The choice of mean losses as the optimum quality criterion implies that the identification process will be maximally accelerated with minimum mean losses. Accordingly, it is necessary to establish the conditions for minimum mean losses and the properties of the optimum solutions. There are various opinions regarding the choice of loss (cost) function. Here, the concept of an asymptotic error covariance matrix as refinement of a simple error covariance matrix is introduced for determining the conditions which will ensure fastest convergence of estimates to the optimum solution. The optimum loss (cost) function is then determined through minimization of this asymptotic matrix with respect to the loss (cost) function. With the general properties of the optimum loss (cost) function defined in terms of Fisher and Shannon information content, it is shown how it can be

determined with incomplete a priori information available. The robustness of loss (cost) functions is examined in statistical terms, considering two known estimation methods: maximum likelihood and least mean squares. Several attempts have been made to extend the concepts covered in this survey, pertaining essentially to dynamic objects minimum-phasal with respect to interference, as well as to other classes of objects with interference of known or unknown spectral density for which there does not necessarily exist an analytical solution. Figures 3; references 54: 22 Russian, 32 Western (16 in translation).
[97-2415]

UDC 62-506.001:519.281

STABILITY OF DECISION RULES IN PATTERN RECOGNITION PROBLEMS

Moscow AVTOMATIKA I TELEMEXHANIKA in Russian No 11, Nov 82
(manuscript received 9 Feb 81) pp 115-123

KHARIN, Yu. S., Minsk

[Abstract] Three problems are involved in automatic pattern recognition according to statistical control theory: 1) analyzing the behavior of the Bayes risk; 2) constructing the decision rule, in the presence of distortions, for the minimum guaranteed upper bound of this risk; 3) determining that minimum guaranteed risk is attainable by this rule. Such a decision rule, called stable in accordance with the overall mathematical formulation, is constructed on the basis of three theorems for the case of "contaminating" distributions as model of distortions and on the basis of two other theorems for the case of additive distortions. The conditional probability distributions, stipulated without learning sample, are assumed to contain errors. The results in each case are applied, for illustration, to the classification of observations representable by the Gaussian undistorted model. The payoff of the stable decision rule relative to the Bayes decision rule is found to increase with increasing Mahalanobis interclass distance. Figures 3; references 14: 7 Russian, 7 Western (1 in translation).
[97-2415]

IMPACT OF FERROMAGNETIC CONDUCTOR SATURATION ON HARMONIC COMPOSITION OF MAGNETIC INDUCTION AND ELECTROMOTIVE FORCE IN CRYOGENIC TURBOGENERATOR

Moscow ELEKTROTEKHNIKA in Russian No 11, Nov 82
(manuscript received 1 Dec 81) pp 32-34

KOSHURNIKOV, Ye. K., candidate of technical sciences, MEDVEDEV, A. V., engineer, SIDEL'NIKOV, A. V., candidate of technical sciences and SHAKHTARIN, V. N., doctor of technical sciences, All-Union Scientific Research Institute for Electrical Machines

[Abstract] Since the use of a highly saturated stator yoke in cryogenic turbogenerators degrades the harmonic composition of the radial component of the magnetic induction in the region of the stator winding and thus the generator e.m.f., it is of interest to study the harmonic composition of this magnetization field by analyzing the no-load mode for various current levels in the excitation winding, along with the impact of the nonlinear properties of various types of electrical grade steels on the e.m.f. harmonics. This analysis is carried out for a variety of ferromagnetic conductor cross-sections. The relative values of the third, fifth and seventh spatial harmonics of the radial induction in the bore of the magnetic conductor are plotted as a function of the relative thickness of the yoke conductor, and the harmonic composition of such a generator under no load is also plotted as a function of yoke thickness. The low level of higher harmonics in the e.m.f. curve, where these are caused by the influence of the non-linearity of the material, makes it possible to wind a stator without abbreviating the pitch. The differences in the magnetic properties of the E-41 and E-330, as well as the anisotropic properties of the E-330 steels, which are widely used, have little influence on the harmonic composition of the radial magnetic induction component in the stator winding or on the harmonic composition of the no-load e.m.f. Figures 3; references: 4 Russian. [94-8225]

UDC 338.4:061.5:628.9

VATRA LIGHTING EQUIPMENT PRODUCTION ASSOCIATION WORK EXPERIENCE

Moscow ELEKTROTEKHNIKA in Russian No 11, Nov 82 pp 52-54

TARANKOV, A. G.

[Abstract] The "Vatra" lighting products production association in Ternopol' is noted as one of the most efficient in the USSR and as producing more than 83% of its products with the State Seal of Quality. The "Vatra" association was the first to develop and introduce a comprehensive system for increasing the national economic impact of new production output

(KSPNKhE), which incorporates various programs as subsystems: a systems for accelerating scientific and engineering progress, one for improving product quality and one for boosting efficiency. About 60% of the increase in production capacities in the past decade in the association is caused by retrofitting and retooling; more than 12% of all workers are in the departments of mechanization and automation, as well as tool making. During this period, the association personnel manufacture more than 1,100 units of high performance special production process equipment with which more than 60% of all work is done. The "Vatra" association also includes VPKTIsvet (All-Union Planning, Design and Production Process Institute for the Illumination Engineering Industry). Engineering and technical workers comprise more than 20% of those working at "Vatra". The large number of supply organizations and administrations at all levels makes a clear-cut production support program difficult. In the opinion of association workers, the supply should be managed at a single level, for example, by a ministry, because now the development of new products and mass consumption goods is being held up by the lack of certain materials produced by the chemical industry, such as dacryl and styrene copolymers. The expansion of the products list and production facilities for consumer goods is also being held up by the lack of a broad assortment of decorative parts and materials such as porcelains and ceramics. There is also a shortage of generator steel and the requisite quantity and assortment of rolled metal products. [94-8225]

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